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TECHNOLOGY ACCEPTANCE IN ACADEMIC ORGANISATIONS: IMPLEMENTATION OF VIRTUAL LEARNING ENVIRONMENTS

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Abstract

This paper presents findings from an ongoing cross-cultural study exploring implementation of Virtual Learning Environments (VLEs) in higher education. Semi-structured interviews were made with key personnel at three university departments providing public health education in Lithuania, Norway and Sweden during 2004-2005. Technology acceptance in the context of the innovation decision process was focused during the interviews. The data was analyzed from the perspectives of innovation diffusion theory and Unified Theory of Acceptance and Use of Technology (UTAUT). Findings give evidence that a high degree of performance expectancy among university staff seems to enhance the implementation process. Factors found to obstruct the implementation process were: 1) the concept of "academic freedom" put forward as an argument for not using educational technology, and 2) an organisational culture depicting teaching on campus as the ideal pedagogical approach.

Keywords: Technology Acceptance, Unified Theory of Acceptance and Use of Technology, Diffusion of innovations, Virtual Learning Environment.

1 INTRODUCTION

Educational technology as represented by Virtual Learning Environments (VLEs) has become widespread in higher education during recent years. VLEs are used both in distance education, and as a complement to teaching on campus, and have been defined as: "Education web platforms providing interaction of various kinds between learners and tutors." (JICS 2002). Ryan et al (2000) describes VLEs as "integrated course delivery systems that provide an environment for the management, delivery and assessment of students studying via the Web" (p. 6). The introduction of VLEs and other forms of e-learning has brought advantages to university education. According to Zhang and Nunamaker (2003), e-learning eliminates the barriers of space and time. Learning can be accomplished whenever a student chooses, and has a potential to reach a global audience, including disabled, part-time, and non-traditional students. Furthermore, cost and time savings are accomplished as learners and instructors do not have to travel to specific locations.

However, the use of educational technology in university education is not uncontroversial. The transition to online teaching and learning presents new challenges as expectations and roles for both staff and students evolve (Bennet & Lockyer 2004). Haywood et al. (2000) identified the following main themes of factors inhibiting the adoption of educational technology in higher education: 1) lack of time, 2) perceptions of low status, and hence rewards, according to teaching compared to research, 3) lack of reliable and adequate infrastructure, including technical support, and 4) lack of basic IT skills. Newton makes the following observation in a study of staff attitudes to development and delivery of e-learning in the UK: "The overall picture which emerges when examining a range of initiatives currently being undertaken across a range of academic institutions is that developments are often led by the enthusiasm of individuals with little extrinsic reward structure to encourage these innovations." (Newton 2003, p. 1)

The "enthusiasm of the few" is necessary but not sufficient to create a sustainable acceptance and use of new educational technology. The success of implementing VLEs is directly related to the acceptance of a critical mass of users. What factors will make users in academic organisations accept educational technology? Narmaala (2004) studied the impact of new educational technology in educational organisation and individual work. Findings suggested that the perception of usefulness played an important role when adapting new technology, but there were also other important factors, such as results demonstrability and job relevance. Perceived ease of use had a significantly lower impact on adapting than perceived usefulness.

1.1 Objective

This study is a part of an ongoing cross-cultural study aiming to explore factors affecting implementation of VLEs in higher education. The objective of this study was to focus on technology acceptance in the context of the innovation decision process from the viewpoint of academic staff. The data was analysed from the perspectives of innovation diffusion theory (Rogers 1995) and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003). These theories are further described in section 2 of the paper.

1.2 Research setting

The study was conducted at three Northern European academic departments providing public health training in Lithuania, Norway, and Sweden. Data was collected from semi-structured interviews which took place during the autumn of 2004 and spring of 2005. The respondents were chosen based on position as decision-maker in the academic organisation, and role in the implementation of the VLE, such as deans, teachers, project managers and student administrators. Eleven interviews were made: three in Lithuania, five in Norway, and three in Sweden. The interviews lasted from 45 minutes to two

hours each, and were tape-recorded and subsequently transcribed. The transcripts were subsequently analysed from the perspectives of innovation diffusion theory and Unified Theory of Acceptance and Use of Technology (UTAUT).

2 THEORETICAL FRAMEWORK

Information systems can only add value to the organisation if they are accepted and used. To predict and explain user acceptance it is necessary to understand why people accept or reject the information system (Davis et al. 1989). There are a number of models explaining technology acceptance of information system users. In this study, the model of UTAUT was chosen according to its high explanatory value (see further section 2.2) and to provide a model exploring *factors* of technology acceptance. To mirror the course of events in the implementation *process* at each university, Rogers (1995) description of innovation decisions in organisations was chosen. Thus, the study was able to depict both influencing factors and the ongoing process.

2.1 The innovation process in organisations

Rogers (1995) describes three original types of organisational innovation decisions: *optional*, *collective* or *authority* decisions. Optional decisions are choices made by an individual to adopt or reject an innovation independent of the other members of the social system. Collective decisions are choices to adopt or reject the innovation made by consensus among the members of a social system. Authority decisions are choices that are made by relatively few individuals in the social system, possessing power, status or technological expertise. In addition, *contingent* innovation decisions are choices to adopt or reject that can be made only after a prior innovation decision. Hence, a decision of an individual teacher to adopt or reject a VLE could only be made after a decision has been made by university managers to use the system in certain courses at the university.

The innovation process in organisations according to Rogers (1995) consist of two broad activities: *initiation*, defined as the entire information gathering, conceptualizing and planning for the adoption of an innovation, and *implementation*, all of the events, actions and decisions involved in putting an innovation into use. Initiation is divided into two stages, *agenda-setting* and *matching*, while implementation comprises the three stages *redefining/restructuring*, *clarifying*, and *routinizing*. Agenda-setting occurs in the innovation process when a general organisational problem that may create a need for an innovation is defined. During this stage a *performance gap*, a discrepancy between an organisations expectations and actual performance, is defined. During the matching stage the innovation is tailored to solve the organisational problem and hence fill the performance gap. The first stage of the implementation is redefining/restructuring, when the innovation is re-invented to accommodate the organisational needs more closely. Clarifying occurs as the innovation is put to a more widespread use and the meaning of the innovation becomes clear to the organisation's members. Routinizing marks the end of the innovation process, as the innovation becomes an incorporated part of the organisation and ceases to be an innovation. The innovation process is depicted in table 1.

I. Initiation		II. Implementation		
1. Agenda-setting	2. Matching	3. Redefining/ restructuring	4. Clarifying	5. Routinizing

Table 1. The innovation process in organisations (Rogers 1995).

2.2 Unified theory of acceptance and use of technology (UTAUT)

Venkatesh et al. (2003) has formulated a unified model of technology acceptance, consisting of core constructs from eight models of technology acceptance[1]; Unified Theory of Acceptance and Use of Technology (UTAUT). When tested empirically by Venkatesh et al, UTAUT was found to explain 70% of the variance of intentions to use and actual usage of information systems. The four core constructs of UTAUT are *Performance Expectancy*, *Effort Expectancy*, *Social Influence* and *Facilitating Conditions*. The core constructs are further defined in table 2. In the table is also included the questions which were used during the interviews to estimate the degree of each construct.

Core constructs	Definition	Questions used in estimating constructs
Performance Expectancy	The degree to which an individual believes that using the system will help him or her to attain gains in job performance.	What advantages has the VLE brought to the education? Are the advantages clearly distinguishable? Are the advantages commonly known among staff? Has using the VLE increased possibilities of communication with colleagues? Has using the VLE increased possibilities of communication with students?
Effort Expectancy	The degree of ease associated with the use of the system.	Do you find the VLE easy to use? Is your communication with the VLE clear and understandable? Is the VLE generally considered to be easy to learn among staff and students?
Social influence	The degree to which an individual perceives that important others believe that he or she should use the system.	Do the university board and management support the use of the VLE? Does staff in general support the use of the VLE? Are there resistance among staff towards the use of the VLE? Is it more prestigious for staff to use the VLE, than not to use it?
Facilitating Conditions	The degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system.	Are there a technical infrastructure supporting the use of the VLE? Are there resources available for pedagogical and technical support? Are there resources available for staff and students to learn to use the system? Are there specific persons or groups available for assistance when problems occur using the VLE?

Table 2. Definitions of core constructs of UTAUT and operationalisation of constructs during interviews.

In the research model of UTAUT, performance expectancy, effort expectancy, social influence and facilitating conditions are independent variables influencing the dependent variables of behavioural intention and usage. Gender, age, experience and voluntariness of system use have an indirect

[1] The eight models of technology acceptance are: Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model, Theory of Planned Behavior (TPB), Combined TAM and TPB, Model of PC-Utilization (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT).

influence on the dependent variables via the four core constructs. The relationships between the variables of the model are depicted in figure 1.

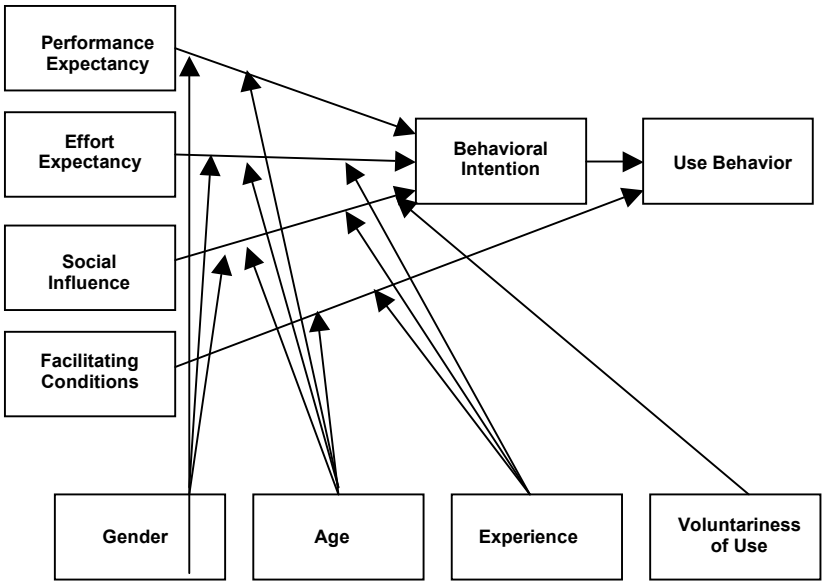

Figure 1. The research model of Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003).

Performance expectancy is the strongest determinant in both voluntary and mandatory settings. It is dependent on gender and age. Effort expectancy influences the behavioural intention to use information systems. The influence of the variable is dependent on gender, age and experience of computer usage. Social influence is only a significant determinant of usage behaviour if usage is mandatory. It also appears to lose its importance as a determining factor over time, as the information system becomes incorporated in the organisation. The influence of the variable will be moderated by gender, age, voluntariness and experience. Also the factor of facilitating conditions influences usage. The influence has been found to be moderated by age and experience in the sense that it is stronger for older workers with less experience of computer usage (Venkatesh et al. 2003).

3 FINDINGS

3.1 The innovation process in organisations

At all three universities, authority decisions were made to implement the VLE. Individual teachers could then decide to adopt or reject the system, but were generally expected to adopt it. The authority decision was hence followed by a contingent decision by every teacher. All three universities had reached the phase of *implementation* in the innovation process, as the VLE was - more or less - put to use. The authority decision of implementing the VLE was though made in different ways and for different reasons at the three university departments.

At the Lithuanian university (LU), the board made a strategic decision to provide opportunities for the university to develop further. The aim of the implementation was to offer a modern and different pedagogical approach, and to make course collaboration with universities abroad possible. The Lithuanian university had reached the stage of *clarifying* in the innovation process at the time of the study.

At the Norwegian university (NU), the original purpose of the department management was to make a collective decision on choice of VLE. This proved not to be possible, as a lot of resistance to the change was evident in the organisation. The resistance was not due to negative feelings about educational technology in general, but to the sense of being forced to use a particular technology in particular ways at particular times. The *academic freedom* of university organisations was put forward as an argument to allow teachers to use a VLE of their personal choice. Finally, the head of the department made an authority decision of implementing the actual VLE. As the VLE chosen was developed at the university, there were no additional costs in purchasing the system. Contributing factors influencing the choice of VLE were also the national identity of the system (Norwegian) and the proximity of system developers and support. The VLE is used as a means of communication in the newly created two year master programme, in order to allow distance studies and improve the number of students, which recently had been decreasing rapidly. The Norwegian university had reached the stage of *redefining/restructuring* in the innovation process at the time of the study.

At the Swedish university (SU), the dean made an authority decision based upon a consensus in a project group, especially appointed to create and evaluate requirements for the new system. The choice of VLE was based on a requirement specification, and proximity of systems developers and support. The decision to implement the VLE was taken for the following reasons: 1) to increase the number of students by neutralizing the borders of time and space in education, 2) to increase flexibility in campus courses, 3) to provide all course material from one single source, 4) to accomplish reuse of course material, and 5) to provide opportunities for reflection by means of asynchronous communication in the VLE. Distance education is thus considered by the university management to be a way of increasing the number of students. The Swedish university had reached the stage of *redefining/restructuring* in the innovation process at the time of the study.

Consequently, the type of innovation decision taken at the three universities was the same: an authority decision followed by a contingent decision by the individual teacher. The Lithuanian university had reached a later stage of the innovation process than the Norwegian and Swedish universities. The innovation process thus seems to proceed more rapid at the Lithuanian university, than at the two Scandinavian universities. The agenda-setting activities – the formulation of the problem solved by the educational technology - during the initiation stage of the innovation process had somewhat different focus at different universities. The Lithuanian university stated a need for strategic development, exemplified by new pedagogical approaches and course collaboration with universities abroad. The focus of the agenda-setting at NU and SU was to increase the number of students. SU furthermore stated the need for flexibility in campus courses and provision of course material from only one digital source.

3.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

Performance expectancy, the degree to which the VLE was believed to enhance the educational tasks of the department, showed its highest degree at LU. The staff found the system useful in communicating with students, providing international courses and reaching distance students in further education. At NU and SU, the most distinguishable advantages of the VLEs were its ability of storage and retrieval of "all educational information from one source" (Dean, Swedish University 2005) and the possibility of students to submit exams and term papers via the VLE. Further advantages could be expected in the future, e. g. the provision of more distance education by means of the VLE. All three university departments agree that the VLE is an excellent provider of information, but experience difficulties in creating vivid interactive communication in the discussion forum between teachers and learners.

NU and SU both reported a high degree of *effort expectanc*y, as the VLE generally seem to be easy to use. These university departments had chosen a VLE originally developed at NU (ClassFronter ®). At LU, the impression of the systems usability was more divergent. Teaching staff sometimes experienced designing courses in the VLE as "quite trying" (Teacher, Lithuanian University 2004),

while others reported system use without any apparent difficulties. KMU had chosen one of the market leading VLEs of the world (WebCT ®).

The degree of *social influence* is high at LU, while being low at NU and SU. At LU, there is a strong sense of system use being supported by the department management and the university management. The university management has explicitly expressed its support for distance education, and hence, use of the VLE. Staff volunteering to use it receives a higher status in the organisation, while those resisting are marginalised. The ongoing debate about the importance of academic freedom at NU has somewhat lowered the status associated with use of the VLE, as academic freedom has been put forward as a legitimate reason for resisting the system. SU has, since 50 years, a tradition of teaching on campus with the students staying at the school for periods of about two to three weeks. This "boarding school system" has been regarded as the primary competitive advantage compared to other public health educations. As the VLE is associated with distance education it is considered to be a threat to the organisational culture. The personnel is divided into two different parties: those defending the old boarding school culture and resisting the VLE, and those open to new ways of teaching, thus defending the VLE.

Staff at NU and SU seems to experience the degree of *facilitating conditions* as high. A reliable organisational and technical infrastructure exists to support the use of the VLE. NU has organised a special department dedicated to distance studies. Furthermore, the original system development of the VLE has been accomplished at the university. At SU a special group comprising one project manager, one teacher and one student administrator provides pedagogical and technical support for users. Also LU provides technical and pedagogical support for teachers, but this support is not experienced as ready available by occasional teachers.

The findings according to the core constructs of UTAUT are summarized in table 3.

	Performance expectancy	**Effort expectancy**	**Social influence**	**Facilitating conditions**
LU	High	Medium	High	Medium
NU	Low	High	Low	High
SU	Low	High	Low	High

Table 3. Findings according to the core constructs of UTAUT.

Conclusively, interviews with staff at the Lithuanian university give evidence of high degrees of performance expectancy and social influence, while effort expectancy and facilitating conditions are experienced to a lower extent. NU and SU display different patterns compared to LU, but for somewhat different reasons. The advantages brought by the VLE are still not distinguishable or commonly known to all staff. The low degree of social influence is due to resistance to the VLE. At the Norwegian university the cause of the resistance is the argument of "academic freedom". At the Swedish university, the VLE is not considered to be compatible with the organisational culture by all members of the staff.

4 CONCLUSION

Even though the three universities started the implementation of the VLE at approximately the same time, the Lithuanian university had reached the more advanced stage of the innovation process (clarifying), at the time of the study. The high perceived degrees of performance expectancy and social influence seem to neutralize the lower degrees of effort expectancy and facilitating conditions, and facilitate the innovation process. On the other hand, the higher degrees of effort expectancy and facilitating conditions at the Norwegian and Swedish university do not seem to compensate for the lack of perceived performance expectancy and social influence, as the innovation processes had reached the less advanced stage of redefining/restructuring at the time of the study. Based on the empirical findings of the ongoing study, it can be concluded that the level of technology acceptance in

academic organisations seems to be highly dependent on cultural and organisational context. A high degree of performance expectancy among academic staff seems to influence technology acceptance in a positive way and drive the organisational innovation process forward. To accomplish this, the advantages brought by the educational technology must be clearly distinguishable. A general agreement among management and staff about these advantages seems to be a critical factor for a successful implementation.

There seems to be at least two main obstacles to acceptance of educational technology inherent in academic organisations: the concept of "academic freedom" and a strong organisational culture of campus-based lectures and seminars. Academic freedom is put forward as an argument for not using educational technology, or only using technology of one's own choice. This reaction seems to be due to perceived use of force by management, rather than to misgivings about the technology. In campus-based organisational cultures, the conversation face to face between teacher and learner is considered indispensable, and impossible to replace with virtual communication.

Consequently, implementation of educational technologies must take organisational factors into account, not restricting the implementation efforts only to technological matters. This finding is in accordance with earlier studies concluding e-learning implementation not to be a technological solution, but a process with cultural consequences (Cech & Bures 2004) and of a negotiation between different organisational cultures (Demetriadis et al. 2003).

The findings of the interviews open up for further research, partly on how opinions about educational technology among academic personnel are created, partly on what factors influence acceptance of educational technology among students. Both of these aspects will be considered in the larger cross-cultural study, of which the interviews are a part.

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